

## Capture Systems

### Ruby Gulch

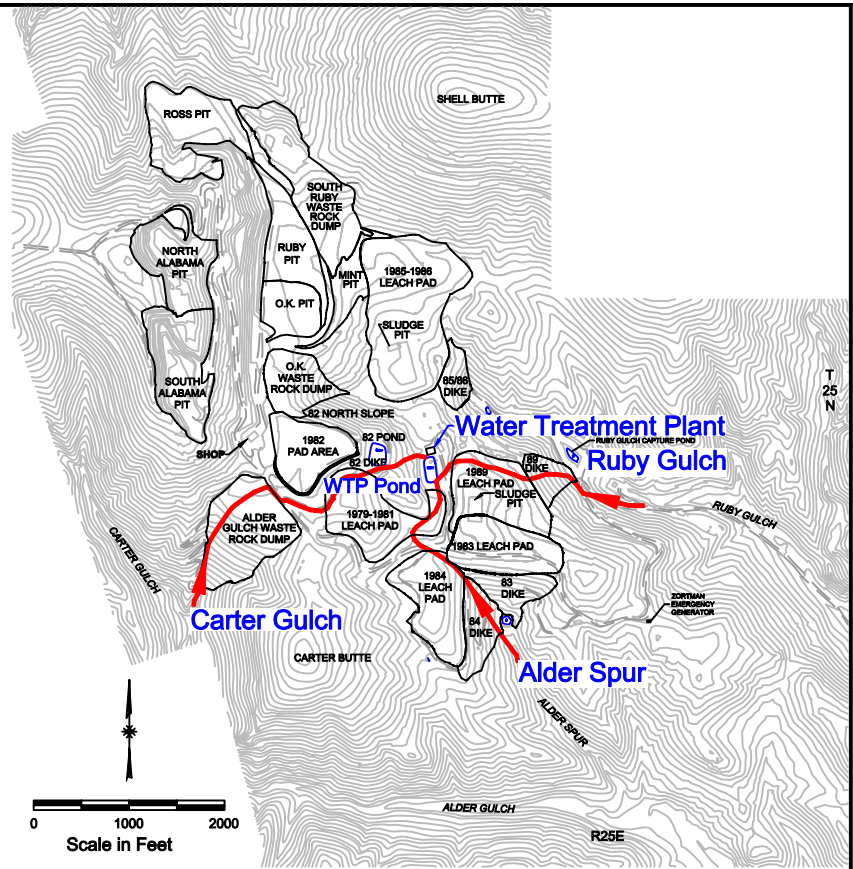
Ruby Gulch Capture Pond - 8.9mm gallon capacity  
-with 36 Mil Hypon Liner  
Capture System - 1-300hp pump @ 2500 gpm  
Capture System - 1-200hp pump @ 1200 gpm  
Avg. Pumpback - 104.2 gpm (Life to Date)  
Avg. Pumpback - 90.3 gpm (2005)

### Alder Spur

Capture Trench - 70,396 gallon capacity  
Capture System - 1-2hp pump @ 12 gpm  
2-15hp pumps @ 84 gpm each  
Avg. Pumpback - 13.1 gpm (Life to Date)  
Avg. Pumpback - 12 gpm (2005)

### Carter Gulch

Capture Trench - 50,011 gallon capacity  
Capture System - 1-3hp pump @ 17 gpm  
1-7.5hp pump @ 43 gpm  
1-60hp pump @ 273 gpm  
Avg. Pumpback - 17.7 gpm (Life to Date)  
Avg. Pumpback - 21.6 gpm (2005)



123.9 gpm for 2005

Ruby Gulch - 90.3 gpm @ 2.5-3.1 pH  
Alder Gulch - 12 gpm @ 4.8-5.0 pH  
Carter Gulch - 21.6 gpm @ 3.1-3.7 pH

50 Ton Storage Guppy

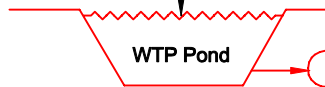
25 Ton Storage Silo  
pH Set Point Range = 6.5-9.0  
Typical pH = 7.25-8.5

93% Calcium Hydroxide  
Hydrated Lime  
(18.4 lbs per 1000 gal)

68% Liquid  
Ferric Sulfate  
(3.53 lbs per  
1000 gal)

Magnafloc 10  
Polymer  
(1.5 pounds/day)

pH Probe



Feed Pump  
1 - 15 hp Pump  
1 - 40 hp Pump

Sludge/Lime  
Mix Tank

Rapid Mix  
Tank

Flocculation  
Tank

Thickener/Clarifier

Ruby Gulch  
Outfall No. 667  
(Effluent pH=7.5)

Sludge Recycle

Sludge Pit on  
Lined Z85/86  
Leach Pad\*

|   | WTP Pond             |                        | Sludge/Lime<br>Mix Tank | Rapid Mix<br>Tank | Flocculation<br>Tank | Thickener/Clarifier |
|---|----------------------|------------------------|-------------------------|-------------------|----------------------|---------------------|
| VOLUME<br>(Gallons)                                       | 4,786,000            | 1600 gpm<br>Max. Input | 10,000                  | 10,000            | 5,000                | 176,300             |
| DETENTION TIME<br>(minutes) at Spring Flow<br>of 1200 gpm | 3,988<br>(2.77 days) |                        | 8.35                    | 8.35              | 4.15                 | 147                 |
| DETENTION TIME<br>(minutes) at Design Flow<br>of 2000 gpm | 2,393<br>(1.7 days)  |                        | 13.3                    | 13.3              | 6.7                  | 235                 |
| DETENTION TIME<br>(minutes) at Average Flow<br>of 600 gpm | 7,977<br>(5.5 days)  |                        | 16.7                    | 16.7              | 8.3                  | 294                 |

### \* Sludge Flow Rate:

Low Flow - 30 gpm, 3 hr/day, 7 days/month, 11 months/year for 415,800 gal/year  
High Flow - 600 gpm, 3 hr/day, 30 days/year for 3,240,000 gal/year  
Total Sludge Flow of 3,655,800 gal/year.

SPECTRUM  
ENGINEERING

1413 4th Ave. North  
Billings, MT 59101  
Phone: (406) 259-2412

February 2006

ZORTMAN MINE  
RECLAMATION PROJECT  
Phillips County, Montana

ZORTMAN WATER TREATMENT  
PROCESS FLOW SCHEMATIC

FILE NAME: 8x112x1\_cap2006.dwg

SHEET NO. 1 OF 1